# A Closer Look at Smoking Among Young Adults: **Where Tobacco Control Should Focus Its Attention**

Molly P. Green, MPH, Kristen L. McCausland, MSW, MPH, Haijun Xiao, MS, Jennifer C. Duke, PhD, Donna M. Vallone, PhD, MPH, and Cheryl G. Healton, DrPH

Despite documented evidence dating back to the 1980s of tobacco industry marketing toward young adults (aged 18-35 years), 1-7 the public health literature on smoking among this demographic in the United States, particularly among non-college-educated young adults, remains relatively sparse. What little attention has been given to smoking among young adults has been devoted largely to college students.<sup>8-13</sup> However, young adults who are not currently enrolled in college or do not hold a college degree represent the majority of the young adult population, 14-15 and thus their behaviors may contribute disproportionately to the high rates of smoking for this age group. 16-17

The smoking behavior of young adults is important for several reasons. First, young adults are at risk for established smoking (i.e., having smoked more than 100 cigarettes in a lifetime and on at least 20 of the last 30 days). Up to 80% of smokers begin smoking before age 18, 18-21 yet the number of individuals aged 18 to 19 years in the early stages of smoking initiation is more than double that of established smokers aged 18 years.<sup>3,20</sup> Recent data suggest that even among smokers who first try smoking in their youth, regular or daily smoking may develop between ages 20 and 21,16 and the cumulative risk of smoking initiation does not begin to plateau until age 22 years. 22-23 Average consumption per smoker also increases in the decade following adolescence.<sup>24–25</sup>

Second, young adulthood is a pivotal period for smoking behavior. Patterns of smoking among young adults are influenced by the significant life transitions that occur during this time. Dramatic changes in social networks, living arrangements, and school or work settings increase susceptibility to smoking.24 As young adults transition to marriage, parenthood, and occupational roles, tobacco use may either be rejected or become an established addiction.<sup>20</sup> Nonsmokers may start

Objectives. We sought to fill gaps in knowledge of smoking behaviors among college-educated and non-college-educated young adults.

Methods. We used data from the 2003 Tobacco Use Supplement of the Current Population Survey to analyze smoking behaviors among young adults aged 18-24 years and older young adults aged 25-34 years by college status (enrolled, or with a degree, but not enrolled) and other measures of socioeconomic position.

Results. Current smoking prevalence among US young adults aged 18–24 years who are not enrolled in college or who do not have a college degree was 30%. This was more than twice the current smoking prevalence among collegeeducated young adults (14%). Non-college-educated young adults were more likely than were college-educated young adults to start smoking at a younger age and were less likely to have made a quit attempt, although no differences were found in their intentions to quit. Higher rates of smoking in the non-collegeeducated population were also evident in the slightly older age group.

Conclusions. Non-college-educated young adults smoke at more than twice the rate of their college-educated counterparts. Targeted prevention and cessation efforts are needed for non-college-educated young adults to prevent excess morbidity and mortality in later years. (Am J Public Health. 2007;97:1427-1433. doi:10.2105/ AJPH.2006.103945)

to smoke, smokers may shift from experimentation to regular smoking, and nonaddicted smokers may become addicted smokers.22

Finally, smoking behavior among young adults is predictive of smoking in later years. A longitudinal study examining the natural history of smoking from adolescence to adulthood found that among those who smoked as young adults, 72% were adult smokers.<sup>26</sup> Among those who did not smoke as young adults, only 7% were adult smokers.<sup>26</sup>

Although few studies have focused on smoking among the non-college-educated young adult population, research suggests that smoking behavior among young adults is a much stronger predictor of smoking in later life for those with less formal education as compared with those with more formal education.<sup>26</sup> Since the early 1980s, rates of current, daily, and heavy smoking have been found to be significantly greater among young adults who are not in college than among young adults in college. 15-16

Given the presumed high smoking rates among non-college-educated young adults and the dearth of related research, we sought to fill the gaps in knowledge of smoking behaviors in this population. We used data from a nationally representative sample of US adults to analyze current smoking among young adults aged 18 to 24 years. We also examined smoking behaviors among young adults aged 25 to 34 years to examine how smoking behaviors may change as young adults enter into a generally more stable phase of life. Our main objective was to characterize patterns in smoking rates and behaviors by college status (in college, with a college degree, or not college educated), and to understand the role of education in smoking behaviors of young adults and older young adults. Although empirical evidence suggests education may be associated with smoking<sup>26-27</sup> and predictive of good health,<sup>28-29</sup> other aspects of socioeconomic position, such as income and occupation, have also been linked to smoking.30 Therefore, we assessed

# **RESEARCH AND PRACTICE**

the independent and combined effects of education, income, and occupation among young adults.

#### **METHODS**

### Sample population

Data for this analysis were drawn from the 2003 Tobacco Use Supplement (TUS) of the Current Population Survey (CPS). The CPS, conducted by the US Census Bureau on a monthly basis, is a national household, interviewer-directed, complex survey administered to the noninstitutionalized, civilian population aged 15 years or older in the United States. The TUS, sponsored by the National Cancer Institute and the Centers for Disease Control and Prevention in 2003, has been added to the CPS every 3 years since 1992 to measure various smoking-related topics.

The 2003 TUS-CPS includes responses from approximately 249 620 individuals, a response rate of 83%. Proxy responses, or information collected from a household respondent for another member of the household, are permitted but not preferred in the TUS-CPS. Nonetheless, 24% of responses in the 2003 TUS-CPS were proxy responses. Proxy responses were excluded from the present analyses so we could compare results to other national studies for this age group in which written questionnaires were completed by the respondents themselves. The final sample consisted of 47 987 respondents aged 18–34 years.

# Measures

Smoking behaviors. Smoking status was partially assessed by the survey item, "Does [respondent] now smoke cigarettes every day, some days, or not at all?" In addition, respondents were asked whether or not they had smoked at least 100 cigarettes in their entire life. Current smokers consisted of both daily and occasional smokers. Age of initiation for current smokers and daily smokers was determined by asking respondents how old they were when they first started smoking cigarettes regularly or every day. Respondents were further probed to determine their number of quit attempts in the past 12 months. Intention to quit was defined as planning to stop smoking within the next 30 days.

College status. A dichotomous variable was created for college status. Among those aged 18 to 24 years, college educated was defined as being currently enrolled in a 2- or 4-year college or university or having at least a college degree but no longer enrolled in school. In the TUS-CPS, school enrollment questions did not distinguish between 2- and 4-year colleges and universities. Because school enrollment status was not asked of respondents aged 25 years and older, the collegeeducated among this age group was comprised of those respondents having at least a degree from a 2- or 4-year college or university. To be assigned to the non-college-educated group, respondents aged 18 to 24 must have reported that they were currently not enrolled in a college or university and that their educational attainment was less than a degree from a 2- or 4-year college or university. For respondents older than 24 years, non-college-educated was defined as having less than a degree from a 2- or 4-year college or university.

Occupation. Occupational data were obtained from respondents and recoded to follow the US Standard Occupational Classification system. Categories were white collar worker (as defined by CPS; includes following categories: management, business, and financial; professional and related; sales and related; and office and administrative support), services worker, farm worker, and blue collar worker (as defined by CPS; includes the following categories: construction and extraction; installation, maintenance, and repair; production; and transportation and material moving).

Employment status. Persons were classified as being in the labor force (if they were employed), unemployed (defined as persons who were not employed during the reference week but were available for work and had made specific efforts to find employment during the past month), or in the Armed Forces during the survey week. We used 3 main levels to denote the major labor force categories available in the TUS-CPS: employed, unemployed, and not in the labor force (defined as persons who had not looked for work during the past month).

Annual household income. Data on annual household income were based on respondents' total combined household income from

the previous 12 months. Combined income included money from jobs; net income from a business, a farm, or rent; dividends; interest; social security payments; and other income received by family members who were aged 15 years or older.<sup>31</sup> As per the procedure used by Barbeau et al.,<sup>30</sup> income data were collapsed into 4 categories of annual earnings: less than \$19 999, \$20 000–49 999, \$50 000 and more, and unknown.

Race/ethnicity and gender. Data on race/
ethnicity were categorized in accordance with
a directive from the Office of Management and
Budget, which stipulated that the 2003 CPS
change its race/ethnicity questions.<sup>34</sup> Categories were no longer mutually exclusive, and
CPS respondents could select more than 1
race when answering the survey. We used the
following categories: non-Hispanic White, nonHispanic Black, Hispanic, Asian, Other, and
Multiple Race. Although the change in wording
does not affect smoking estimates and trends
for the nation, it potentially affects smoking
estimates and trends by race/ethnicity.

CPS respondents were asked to indicate their gender as male or female.

# **Data Analysis**

Population estimates were generated to describe the demographic characteristics of the college-educated and non-college-educated populations among 2 age groups: those aged 18-24 years and those aged 25-34 years. Additional descriptive statistics were calculated to illustrate the prevalence of smokingrelated behaviors. Along with smoking prevalence, age of smoking initiation, intent to quit, and attempts to quit were computed for current smokers. To determine the odds of being a current smoker in relation to education, age, gender, annual household income, occupation, and employment status, a multiple logistic regression was performed. All data were analyzed using Stata version 9.2. (Stata Corp., College Station, Tex). Survey weights were used to adjust for nonresponse and to control for age, gender, race, and Hispanic ethnicity.

### **RESULTS**

Table 1 presents the distribution of the study population by college status and age group in relation to gender, race/ethnicity,

TABLE 1—Sociodemographic Characteristics of Young Adults Aged 18-34 Years, by College Status and Age: United States, Current Population Survey, 2003

	Aged 18-24 Ye	ars (n = 16 395)	Aged 25-34 Years (n = 31 592)		
	College Educated, <sup>a</sup> %	Non-college- Educated, <sup>a</sup> %	College Educated, <sup>a</sup> %	Non-College- Educated, <sup>a</sup> %	
Gender					
Men	41.7	46.7	42.5	45.3	
Women	58.3	53.3	57.5	54.7	
Race/ethnicity					
Non-Hispanic White	74.7	63.5	79.4	61.7	
Non-Hispanic Black	8.6	11.6	6.0	11.5	
Hispanic	8.8	19.2	5.9	20.9	
Asian	4.9	1.6	6.8	2.2	
Other	0.9	2.0	0.7	2.0	
Multiple race	2.0	2.0	1.2	1.7	
Annual household income					
<\$19 999	25.0	30.4	7.0	23.0	
\$20 000-49 999	30.5	37.2	29.1	41.8	
≥\$50 000	35.1	22.4	56.6	25.8	
Unknown	9.4	10.1	7.3	9.4	
Occupation					
White collar workers <sup>b</sup>	49.8	32.3	74.8	35.6	
Service worker (waiter, bartender, etc.)	16.9	22.8	7.6	17.7	
Farm worker	0.5	1.2	0.2	1.0	
Blue collar workers <sup>c</sup>	8.0	23.5	6.4	26.1	
Not in labor force <sup>d</sup>	24.8	20.0	10.9	19.6	
Employment Status					
Employed	69.0	68.9	85.8	73.5	
Unemployed <sup>e</sup>	5.6	11.7	2.9	6.6	
Not in labor force <sup>d</sup>	25.4	19.5	11.3	20.0	

*Note. P* values derived from  $\chi^2$  tests for categorical variables between college-educated and non-college-educated respondents were all significant at the 0.01 level, except for multiple race and employed among respondents aged

annual household income, occupation, and employment status. The total number of young adults responding without proxy to the survey was 16 673 among those aged 18-24 years and 32839 among those aged 25-34 years. The non-college-educated group represented 60% of young adults and 58% of the older young adult group.

In a group-wide comparison of young adults aged 18-34 years, non-collegeeducated young adults were more likely than college-educated young adults to be male, non-Hispanic Black or Hispanic, earn less than \$50000, and to work in service and blue-collar industries or be unemployed. One reason that a considerable percentage

(25.4%) of college-educated young adults aged 18-24 years were not in the labor force is that they were currently attending school.

Between young adults aged 18-24 years and those aged 25-34 years, income, occupation, and employment status differed. In the non-college-educated group, the differences were generally modest; in particular, annual household income increased so that a larger proportion of those in the older age group compared to those in the younger age group earned between \$20000-49999 (41.8% vs 37.2%, respectively). By contrast, in the college-educated group, income increased substantially so that the majority of those aged 25-34 (56.6%) earned \$50000 or more. This compares to only 35.1% of collegeeducated young adults in the 18-24 year old group who were earning \$50000 or more. Further, in the college-educated group, notable increases were found between the younger and older age groups and in the percentage of white-collar workers (49.8% vs 74.8%, respectively) and those who were employed (69.0% vs 85.8%, respectively).

An estimated 23.4% of young adults aged 18-24 years in the United States were selfreported current smokers in 2003. The current smoking prevalence among non-collegeeducated young adults was twice that among college-educated young adults (30.0% vs 14.2%, respectively). In addition, the daily smoking prevalence of the non-collegeeducated population (24.4%) was more than double that of the college-educated population (9.0%). Further, smoking rates in the non-college-educated group of young adults were substantially higher than those in the college-educated group of young adults when examined by categories of gender, race/ ethnicity, annual household income, occupation, and employment status (Table 2). Only among farm workers were no differences found in smoking prevalence by educational attainment. This result may be partially explained by the small sample size among farm workers in this age group (n=162).

Among young adults aged 25-34, 20.8% were current smokers. Similar to findings for young adults in the younger age group, among young adults in the older age group, there was more than a double difference in current smoking prevalence between the

<sup>&</sup>lt;sup>a</sup>Among those aged 18 to 24 years, college educated was defined as being currently enrolled in a 2- or 4-year college or university, or having at least a college degree but being no longer enrolled in school. The non-college-educated group comprised those that were not enrolled in a college or university and whose educational attainment was less than a degree from a 2- or 4-year college or university. For respondents older than 24 years, non-college-educated was defined as having less than a degree from a 2- or 4-year college or university.

<sup>&</sup>lt;sup>b</sup>As defined by CPS; includes following categories: management, business, and financial; professional and related; sales and related; and office and administrative support.

<sup>&</sup>lt;sup>c</sup>As defined by CPS; includes following categories: construction and extraction; installation, maintenance, and repair; production; and transportation and material moving.

<sup>&</sup>lt;sup>d</sup>Defined as persons who had not looked for work during the past month.

<sup>&</sup>lt;sup>e</sup>Defined as persons who were not employed during the reference week but were available for work and had made specific efforts to find employment during the past month.

TABLE 2—Current Smoking Prevalence Among Young Adults Aged 18–34 Years, by College Status and Age: United States, Current Population Survey, 2003

	Aged 18-24 Years (n = 16 395)		Aged 25-34 Years (n = 31 592)		
	College Educated, <sup>a</sup> %	Non-College- Educated, <sup>a</sup> %	College Educated, <sup>a</sup> %	Non-College- Educated, <sup>a</sup> %	
Total	14.2	30.0	11.6	27.2	
Gender					
Men	15.0	32.3	13.2	29.9	
Women	13.6	27.7	10.3	24.9	
Race/ethnicity					
Non-Hispanic White	16.6	37.6	12.7	35.7	
Non-Hispanic Black	6.5	23.1	6.8	19.7	
Hispanic	8.0	14.1	10.9	13.7	
Asian	8.5	21.8	7.1	21.1	
Other	11.9	41.4	14.0	35.0	
Multiple race	22.7	47.3	12.3	41.0	
Annual household income					
<\$19 999	18.7	34.5	18.0	31.3	
\$20 000-49 999	14.9	31.1	15.7	27.8	
≥\$50 000	10.9	24.0	9.0	24.0	
Unknown	12.8	25.5	10.6	23.8	
Occupation					
White colla worker <sup>b</sup>	14.7	28.1	10.5	25.7	
Service worker (waiter, bartender, etc.)	19.6	34.9	17.6	27.1	
Farm worker	26.3	32.1	4.3	22.3	
Blue collar worker <sup>c</sup>	19.8	34.1	23.3	31.7	
Not in labor force <sup>d</sup>	8.5	22.5	8.8	24.1	
Employment Status					
Employed	15.6	30.7	11.7	26.9	
Unemployed <sup>e</sup>	21.7	36.9	19.5	38.6	
Not in labor force <sup>d</sup>	9.1	23.1	8.6	24.5	

Note. P values derived from  $\chi^2$  tests for categorical variables between college-educated and non-college-educated respondents were all significant at the 0.01 level, except for multiple race and employed among respondents aged 18-24 years.

aAmong those aged 18 to 24 years, college educated was defined as being currently enrolled in a 2- or 4-year college or university or having at least a college but being no longer enrolled in school. The non-college educated group

university, or having at least a college degree but being no longer enrolled in school. The non-college-educated group comprised those that were not enrolled in a college or university and whose educational attainment was less than a degree from a 2- or 4-year college or university. For respondents older than 24 years, non-college-educated was defined as having less than a degree from a 2- or 4-year college or university.

non-college-educated group (27.2%) compared with the college-educated group (11.6%). Moreover, among young adults in the 25–34 year age group, there was a nearly triple difference in daily smoking prevalence between the non-college-educated and college-educated groups

(21.6% vs 7.3%). Except for Hispanics, current smoking rates among non-college-educated young adults aged 25–34 years were 2 to 3 times those of their college-educated counterparts when examined by categories of race/ethnicity. Current smoking among the non-college-educated group was

also meaningfully higher across categories of gender, income, occupation, and employment status when compared with current smoking among their college-educated peers.

Further examination of smoking behaviors among young adults in the 18-24 year age group by income, occupation, and employment status reveals that individuals who earn a low annual income (i.e., less than \$20000 per year), work in service and blue-collar jobs, and are unemployed have the highest smoking rates, regardless of educational attainment. This finding is relatively consistent for young adults in the 25-34 year age group as well, suggesting that smoking varies by other aspects of socioeconomic position in addition to educational attainment and that the characteristics of smokers do not markedly change in the later years of young adulthood.

Table 3 presents smoking behaviors among current smokers by age group and college status. Differences were found by age group within both the college-educated and non-college-educated groups, such as those aged 18-24 years were more likely than those aged 25-34 years to have started smoking earlier in life and have made a quit attempt. Findings by college status show that compared with current smokers without a college education, those with a college education were more likely to have started smoking later in life and to have attempted to quit. However, there were no differences in intentions to quit smoking between the collegeeducated and non-college-educated groups.

Results by college status indicate that the trajectory toward a college education may protect individuals from initiating smoking earlier in life. Although educational attainment may influence attempts to quit, there appears to be no effect of educational attainment on intentions to quit. Indeed, 2 out of 5 young adults aged 18–24 years reported intending to quit smoking within the next 30 days regardless of educational attainment.

Adjusted odds ratios of current smoking for young adults aged 18–34 years are presented in Table 4. Taking into account the effects of age, gender, annual household income, and occupation, the adjusted odds ratio (OR) of current smoking for adults aged 18–34 years without a college education compared with

<sup>&</sup>lt;sup>b</sup>As defined by CPS; includes following categories: management, business, and financial; professional and related; sales and related; and office and administrative support.

<sup>&</sup>lt;sup>c</sup>As defined by CPS; includes following categories: construction and extraction; installation, maintenance, and repair; production; and transportation and material moving.

<sup>&</sup>lt;sup>d</sup>Defined as persons who had not looked for work during the past month.

Defined as persons who were not employed during the reference week but were available for work and had made specific efforts to find employment during the past month.

TABLE 3—Smoking Behaviors Among Young Adults Aged 18-34 Years, by College Status and Age: United States, Current Population Survey, 2003

	Aged 18-24 Years (n = 16 395)			Aged 25-34 Years (n = 31 592)		
	College Non-College- Educated, a Educated, a			College Educated, <sup>a</sup>	Non-College- Educated, <sup>a</sup>	
	%	%	Р	%	%	Р
Started smoking at age 18 and older	41.5	25.4	.00	57.3	38.7	.00
Intended to quit within the next 30 days	43.4	39.2	.21	44.7	40.1	.07
Attempted to quit in the past 12 months	54.2	43.8	.00	48.8	40.4	.00

Note. P values were derived from  $\chi^2$  tests for categorical variables between college-educated and non-college-educated

those with a college education is 2.31 (95% confidence interval [CI]=2.17, 2.46). This suggests that there is a protective effect in attending college that goes above and beyond the money, prestige, and resources that a formal education offers. That is, collegeeducated young adults may be more informed and supported in their efforts to achieve and maintain healthier behaviors (notably less tobacco use) than their non-college-educated peers.

# **DISCUSSION**

We found that the current smoking prevalence among non-college-educated young adults aged 18-24 years is more than twice as high as that among their college-educated peers. Nearly one third of those young adults in the United States who are not enrolled in college or do not hold a college degree smokes. In contrast, smokers comprise only 14% of young adults currently enrolled in college or with a college degree. This discrepancy is maintained, for the most part, across gender, race/ethnicity, annual household income, occupation, and employment status categories. Even in the slightly older age group of 25-34 years, smoking prevalence in the non-college-educated population remains twice as high as that found in the college-educated population.

Our estimates of current smoking prevalence are lower than those calculated from recent Monitoring the Future surveys, an ongoing annual effort funded by the National Institute on Drug Abuse and conducted at the University of Michigan's Institute for Social Research that monitors alcohol,

tobacco, and illicit drug use among youths and young adults in the United States. These data indicate that 37% of non-collegeeducated young adults 1-4 years beyond high school smoke compared with 24% of full-time college students. 17 Nonetheless, together these findings provide consistent empirical evidence of the disproportionately higher smoking rates among non-collegeeducated compared with college-educated young adults. Moreover, a college education, above and beyond other socioeconomic determinants, was found to be a strong independent predictor of smoking. Annual household income and occupation were also found to be important independent predictors of smoking, but educational attainment was the strongest independent predictor among the factors we examined, exhibiting a 2 times effect on smoking prevalence. Our study also demonstrated that although overall smoking prevalence declined somewhat for young adults aged 25-34 years, the disparity in smoking prevalence between the collegeeducated and the non-college-educated populations is maintained.

This documented decrease in overall smoking prevalence from young adulthood into slightly older young adulthood may be explained, in part, by fewer transitions in employment, housing, and location that possibly contributed to increased smoking behaviors during earlier years. That is, a stronger sense of constancy following several years of fluctuation may translate into a lower smoking prevalence among slightly older young adults.

Several limitations ought to be considered in interpreting our findings. First, data from the TUS-CPS are cross-sectional. Therefore,

TABLE 4—Adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for **Current Smoking Among Young Adults** Aged 18-34 Years: United States, **Current Population Survey, 2003** 

Outcome Variable	Current Smoking, Adjusted OR (95% CI)
Education	
Non-college educated <sup>a</sup>	2.31 (2.17,2.46)
College educated <sup>a</sup>	1.00
Age, y	
18-24	1.12 (1.06,1.19)
25-34	1.00
Gender	
Woman	1.00
Man	1.16 (1.09,1.23)
Annual Household Income	
<\$19 999	1.77 (1.64,1.91)
\$20 000-49 999	1.43 (1.34,1.53)
≥\$50000	1.00
Unknown	1.12 (1.01,1.24)
Occupation	
White collar worker <sup>b</sup>	1.00
Service worker (waiter,	1.21 (1.11,1.30)
bartender, etc.)	
Farm worker	0.86 (0.63,1.17)
Blue collar worker <sup>c</sup>	1.30 (1.21,1.41)
Not in labor force <sup>d</sup>	0.77 (0.71,0.83)

<sup>a</sup>Among those aged 18 to 24 years, college educated was defined as being currently enrolled in a 2- or 4-year college or university, or having at least a college degree but being no longer enrolled in school. The non-college-educated group comprised those that were not enrolled in a college or university and whose educational attainment was less than a degree from a 2- or 4-year college or university. For respondents aged older than 24 years, non-collegeeducated was defined as having less than a degree from a 2- or 4-year college or university. <sup>D</sup>As defined by CPS; includes following categories: management, business, and financial; professional and related; sales and related; and office and administrative support. <sup>c</sup>As defined by CPS; includes following categories: construction and extraction; installation, maintenance, and repair; production; and transportation and material moving. dDefined as persons who had not looked for work

results for young adults aged 18-24 years and those aged 25-34 years do not represent trends over time for a particular cohort. Second, TUS-CPS respondents were more

during the past month.

# RESEARCH AND PRACTICE

likely to be women than men, suggesting that certain groups of men were excluded from the study population. Third, for those aged 18 to 24 years, the TUS-CPS provides college enrollment status but does not distinguish between 2- and 4-year colleges and universities. Although levels of educational attainment are more clearly defined than school enrollment, associate degree or an undergraduate degree were grouped together for comparisons with respondents who were currently enrolled in college. As a result, certain socioeconomic and smoking disparities between respondents with a 2- and 4-year college education may have been masked. Further, differences between those with some college education and those who completed college may not have been detected. Finally, the TUS-CPS was an in-person household survey. This mode of administration may have introduced interview bias and lead to an underestimation of smoking behaviors, especially if respondents consider smoking to be socially unacceptable.

Overall, our findings indicate that the majority of young adult smokers aged 18–24 years do not have a college education, work in service and blue-collar jobs, and earn low annual incomes. Moreover, this pattern remains more or less consistent in the 25-34 year age group. Low socioeconomic position contributes to increased morbidity and premature mortality in later years. This underscores the urgency to develop interventions designed specifically for this population, a large proportion of which wants to quit.

Past and present cessation programs for young adults have generally been confined to accessible or receptive populations, including pregnant women, military personnel, and college students.<sup>3,35</sup> To more effectively target socially disadvantaged young adults, strategies used by the tobacco industry might be considered. That is, tobacco companies promote their products at bars, nightclubs, and sporting events.<sup>2,3,36</sup> These same venues may serve as prime locations for implementing programs and policies to reduce environmental tobacco smoke, establishing social support for smoking cessation, and distributing cessation aids such as nicotine replacement therapy to non-college-educated young adults. 30,37

Worksites are another potential venue for tobacco control efforts targeted to

non-college-educated young adults.38 Cessation programs for service workers ought to be offered in restaurants and retail outlets because nearly one quarter of non-collegeeducated young adults work in the service industry and 34.9% of them smoke. Other worksite programs need to focus on construction and manufacturing sites because 23.5% of young adults aged 18-24 and 26.1% of adults aged 25-34 work in blue-collar jobs and approximately one third of them are smokers. Worksites may also foster social support networks to assist people who are trying to quit. Finally, because income is inversely related to smoking, cessation services at worksites ought to be free or offered at low cost.

For over 2 decades, non-college-educated young adults have been disproportionately burdened by smoking. At the same time, a disproportionate share of tobacco control research has focused on young adults in college. Findings from the current study support the growing realization that non-collegeeducated young adults are a priority for tobacco control programs and policies. Providing effective, evidence-based cessation materials and resources in the places where non-college-educated young adults frequent may help close the gaps in reported smoking behaviors by educational attainment. Indeed, the best opportunity to reduce the high smoking prevalence among young adults resides in devoting needed translational research (i.e. the process of applying ideas based on research or scientific inquiry to the prevention of a disease or the promotion of a healthy behavior) and following through with essential resources that suit the expressed needs of the non-college-educated population. ■

# **About the Authors**

All authors are with the American Legacy Foundation, Washington, DC. Cheryl G. Healton is also with the Mailman School of Public Health, Columbia University, New

Requests for reprints should be sent to Molly P. Green, MPH, American Legacy Foundation, 2030 M Street, NW, 6th Floor, Washington, DC 20036 (e-mail: mgreen@ americanlegacy.org).

This article was accepted December 11, 2006.

# Contributors

M.P. Green developed the conceptual approach, contributed to data interpretation, and prepared the original draft of the article. K.L. McCausland contributed to the conceptual approach and data interpretation, and participated in preparation of the original draft of the article. H. Xiao conducted all data analyses and participated in the preparation of the original draft of the article. I.C. Duke contributed to the conceptual approach and participated in the preparation of the final draft. D.M. Vallone and C.G. Healton participated in the preparation of the final draft.

## **Acknowledgments**

This study was supported by the American Legacy

We express our appreciation to Mary Northridge for her guidance and insightful comments on the final draft.

### **Human Participant Protection**

This study did not involve individual-level data and was exempted from institutional review board approval.

#### References

- Sepe E, Glantz SA. Bar and club tobacco promotions in the alternative press: targeting young adults. Am J Public Health. 2002;92:75-78.
- Sepe E, Ling PM, Glantz SA. Smooth moves: bar and nightclub tobacco promotions that target young adults. Am J Public Health. 2002;92:414-419.
- 3. Ling PM, Glantz SA. Why and how the tobacco industry sells cigarettes to young adults: evidence from industry documents. Am J Public Health. 2002;92: 908-916.
- Ferris Wayne G, Connolly GN. How cigarette design can affect youth initiation into smoking: Camel cigarettes 1983-1993. Tob Control. 2002;11:i32-39.
- Wakefield M, Morley C, Horan JK, Cummings KM. The cigarette pack as image: new evidence from tobacco industry documents. Tob Control. 2002;11: i73-i80.
- Barbeau EM, Leavy-Sperounis A, Balbach ED. Smoking, social class, and gender: what can public health learn from the tobacco industry about disparities in smoking? Tob Control. 2004;13:115-120.
- Hafez N, Ling PM. Finding the Kool Mixx: how Brown & Williamson used music marketing to sell cigarettes. Tob Control. 2006;15:359-399.
- Schorling JB, Gutgesell M, Klas P, Smith D, Keller A. Tobacco, alcohol, and other drug use among college students. J Subst Abuse. 1994;6:105-115.
- Emmons KM, Wechsler, Dowdall D, Abraham M. Predictors of smoking among US college students. AmJ Public Health. 1998;88:104-107.
- 10. Weschler H, Rigotti NA, Gledhill-Hoyt J, Lee H. Increased levels of cigarette use among college students: a cause for national concern. JAMA. 1998;280: 1673-1678.
- 11. Everett A, Husten CG, Kann L, Warren CW, Sharp D, Crosset L. Smoking initiation and smoking patterns among US college students. J Am Coll Health. 1999:48:55-60.
- 12. Rigotti NA, Lee JE, Wechsler H. US college students' use of tobacco products: results of a national survey. JAMA. 2000;284:699-507.
- 13. Wetter DW, Kenford SL, Welsch SK, et al. Prevalence and predictors of transitions in smoking behavior

# RESEARCH AND PRACTICE

among college students. *Health Psychol.* 2004;23: 168–177

- 14. US Census Bureau. Educational Attainment in the United States: 2004. Table 1. Available at: http://www.census.gov/population/www/socdemo/education/cps2004.html. Accessed September 18, 2006.
- 15. Fox MA, Connolly BA, Snyder TD. Youth Indicators 2005: Trends in the Well-Being of American Youth. Washington DC: National Center for Education Statistics, US Department of Education; 2005. Document NCES 2005–050.
- Lantz PM. Smoking on the rise among young adults: implications for research and policy. *Tob Control*. 2003;12(suppl 1):i60–i70.
- 17. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. Monitoring the Future National Survey Results on Drug Use, 1975–2003. Volume II: College Students and Adults Ages 19–45. Bethesda, Md: National Institute on Drug Abuse; 2004;267. NIH Publication No. 04–5508.
- 18. Burns DM, Lora L, Vaughn JW, Chiu YK, Shopland D. Rates of smoking initiation among adolescents and young adults. *Tob Control.* 1995;4:S2–S8.
- Everett SA, Warren CW, Sharp D, Kann L, Husten CG, Crossett LS. Initiation of cigarette smoking and subsequent smoking behavior among US high school students. *Prev Med.* 1999;29:327–333.
- 20. Biener L, Albers AB. Young adults: vulnerable new targets of tobacco marketing. *Am J Public Health*. 2004;94:326–330.
- 21. Mowery PD, Brick PD, Farrelly MC. Legacy First Look Report 3. Pathways to Established Smoking: Results from the 1999 National Youth Tobacco Survey. Washington DC: American Legacy Foundation; 2000.
- 22. Backinger CL, Fagan P, Matthews E, Grana R. Adolescent and young adult tobacco prevention and cessation: current status and future directions. *Tob Control*. 2003;12(suppl 4):iv46–iv53.
- 23. DeWit DJ, Offord DR, Wong M. Patterns of onset and cessation of drug use over the early part of the life course. *Health Educ Beh.* 1997;24:746–758.
- 24. Hammond D. Smoking behavior among young adults: beyond youth prevention. *Tob Control.* 2005; 14:181–185.
- 25. Johnston ML, Daniel BC, Levy CJ. Young smokers prevalence trends, implications, and related demographic trends. Philip Morris USA, March 31, 1981. Bates No. 1000390801/0855. Available at: http://pmdocs.com/PDF/1000390803\_0855\_0.pdf. Accessed June 8, 2007.
- 26. Chassin L, Presson CC, Rose JS, Sherman SJ. The natural history of cigarette smoking from adolescence to adulthood: demographic predictors of continuity and change. *Health Psychology.* 1996;15:478–484.
- 27. Pierce JP, Fiore MC, Novotny TE, Hatziandreu EJ, Davis RM. Trends in cigarette smoking in the United States. Educational differences are increasing. *JAMA* 1989:261:56–60.
- 28. Deaton A. Policy implications of the gradient of health and wealth. *Health Affairs*. 2002;21:13–30.
- 29. Winkleby MA, Jatulis DE, Frank E, Fortmann SP. Socio-economic status and health: how education, income and occupation contribute to risk factors for cardiovascular disease. *Am J Public Health.* 1992;82: 816–820.

- 30. Barbeau EM, Krieger NK, Soobader M. Working class matters: socioeconomic disadvantage, race/ethnicity, gender, and smoking in NHIS 2000. *Am J Public Health*. 2004:94:269–278.
- 31. US Census Bureau. Current Population Survey: February, June, and November 2003: Tobacco Use Suppl File. Available at: http://www.census.gov/apsd/techdoc/cps/cpsfenjunnov03.pdf. Accessed September 22, 2006.
- 32. Standard Occupational Classification User Guide. Washington, DC: Bureau of Labor Statistics, US Department of Labor. Available at: http://www.bls.gov/soc/socguide.htm. Accessed September 22, 2006.
- 33. Giovino GA, Pederson L, Trosclair A. The prevalence of selected cigarette smoking behaviors by occupational class in the United States. In: Work, Smoking. and Health: A National Institute of Occupational Safety and Health (NIOSH) Scientific Workshop. Washington, DC: National Institute for Occupation Safety and Health; 2000. Available at: http://www.cdc.gov/niosh/docs/2002-148/pdfs/2002-148.pdf. Accessed September 22, 2006.
- 34. Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity. *Federal Register*. October 30, 1997; 62FR58781-58790. Available at: http://www.whitehouse.gov/omb/fedreg/1997standards.html. Accessed September 22, 2006.
- 35. Wechsler H, Kelley K, Seibring M, Kuo M, Rigotti NA. College smoking policies and smoking cessation programs: results of a survey of college health center directors. *J Am Coll Health*. 2001;49:205–212.
- 36. Katz SK, Lavack AM. Tobacco related bar promotions: insights from tobacco industry documents. *Tob Control.* 2002;11(suppl 1):92–101.
- 37. Ling PM, Glantz SA. Using tobacco-industry marketing research to design more effective tobacco-control campaigns. *JAMA*. 2002;287:2983–2989.
- 38. Gritz ER, Thompson B, Emmons K, Ockene JK, McLerran DF, Nielsen IR. Gender differences among smokers and quitters in the Working Well Trial. *Prev Med.* 1998;27:553–561.

# Regulating Tobacco

Edited by Robert L. Rabin and Stephen D. Sugarman

Essays by eleven leading experts analyze specific strategies that have been used to influence tobacco use and set them against the latest scientific findings about tobacco use and the changing cultural and political setting against which policy decisions are being made.

Published by Oxford University Press

# **ORDER TODAY!**

ISBN 0-19-514756-1

312 pages, softcover, 2001 **\$15.00** 



American Public Health Association PUBLICATION SALES

**WEB:** www.apha.org **E-MAIL:** APHA@pbd.com

TEL: 888-320-APHA FAX: 888-361-APHA